NOTES ON FOUR ADVENTIVE COMPOSITES IN ISRAEL

A. DANIN*

ABSTRACT. Three species of *Conyza*, *C. bonariensis*, *C. canadensis* and *C. albida*, and one species of *Aster*, *A. subulatus*, natives of N and S America, are widespread today all over Israel. There is, however, no record of three of them in the same area before the start of this century. Their habitats and rates of invasion are discussed.

INTRODUCTION

The invasion of adventive plants from remote floras to the Mediterranean countries is a well-known phenomenon and Zohary (1973) marks this invasion as the beginning of the "neo-segetal era". In this note we wish to deal with four rather aggressive adventive colonizing species in Israel. The data on their distribution before 1970 are based on specimens in the herbarium of the Hebrew University, Jerusalem (HUJ), identified by Prof. N. Feinbrun in connection with the account of the Compositae for *Flora Palaestina* (Feinbrun, in press); a list of them is presented in the appendix. Data after 1970 are in part the results of the author's own observations.

CONYZA LESS.

Three annual species of *Conyza* have so far been found in Israel, namely *C. bonariensis* (L.) Cronq., *C. canadensis* (L.) Cronq. and *C. albida* Willd. ex Spreng.

Nomenclatural problems concerning these species have been discussed by Cronquist (1943), Burtt (1948), Jovet (1964), Marshall (1973), Guédès (1973) and Guédès & Jovet (1975). The three species may be distinguished as follows:

1. Leaves glabrous, except for retrorse or patent cilia on their margins and scattered hairs along the midveins. Phyllaries glabrous with a transparent oil-filled midvein. Achene with a pappus 3–3·5 mm long . . . . . 2. *C. canadensis*
\+ Leaves hairy throughout, phyllaries hairy; midvein not as above. Achene with a pappus 4–5 mm long 2
2. Cauline leaves below inflorescence 5–20 mm wide, irregularly dentate to incised. Main axis terminally paniculate, forming a pyramidal compound inflorescence. Flowering heads 2–5 mm in diam.; receptacle areolate to scrobiculate. Mostly tall plants c. 150–200 cm, with winter leaf rosettes . . . . . 3. *C. albida*
\+ Cauline leaves narrower, up to 6 mm wide, slightly dentate to entire. Lateral branches often overtopping or at least equalling the main axis. Flowering heads 5–7 mm in diam.; receptacle slightly muricate. Mostly plants up to 50 cm high, with no winter leaf rosettes . . . . . 1. *C. bonariensis*

* Department of Botany, The Hebrew University, Jerusalem, Israel.

1. C. bonariensis (L.) Cronq. in Bull. Torrey Bot. Club 70:632 (1943).

For synonyms see Marshall (1973).

The localities nearest to Israel recorded in *Flora Orientalis* by Boissier (1875) are the coastal area of Beirut (Lebanon) and Alexandria and Cairo (Egypt). Post (1883–1896) reports it from "the coast of Syria and lower zone of Lebanon". Bornmueller (1898:598) found it near Jaffa in 1896 and marked it as new to Palestine. It was collected by Aaronsohn in 1906 near Jaffa and near Sarona (NE Tel-Aviv today) and in Zikhron Ya'aqov in 1907 (Oppenheimer & Evenari, 1941). Dinsmore (in Post, ed. Dinsm., 1932–33) recorded it from Jerusalem, Jaffa, Rishon le Zion, Nablus, Wadi el Kelt and Jericho.

From figure 1, it is obvious that this species is now widespread all over the country. It occupies habitats with sufficient water supply in summer. These are fallow and irrigated fields and gardens, ditches, river banks and newly constructed roadsides. In the last habitat, rain water penetrates the ground in winter; as no annual species grow there in winter for several years, there is sufficient water for plant growth in summer (Negbi, 1968).

C. bonariensis is an effective colonizer with many light diaspores per plant. In five heads studied, the number of diaspores per head varied from 150 to 450. A plant commonly bears some 50 such heads comprising up to 7500–23000 diaspores.

2. C. canadensis (L.) Cronq. in Bull. Torrey Bot. Club 70:632 (1943).

For synonyms see Marshall (1973).

This was collected for the first time in 1940 by T. Kushnir near the river Hatsbani in the northern part of the country. It might have arrived from Lebanon (Nahr el Kalb) where it was found before 1933 (Post, ed. Dinsmore, 1933). It has now been recorded from several other places in Israel (see appendix).

Figure 2 gives the localities where it was recorded up to 1975. It seems to be less drought-resistant than *C. bonariensis* as so far it has not been found south of Be'er-Sheva. Although like the latter, it grows in ditches, inundated river-banks and irrigated fields and less commonly on roadsides, it seems to prefer the moister habitats.

The number of achenes per head is smaller here but the number of heads per plant is much greater.

3. C. albida Willd. ex Spreng., Syst. Veg. 3:512 (1826).

For synonyms see Guédès & Jovet (1975).

It is not clear when *C. albida* first entered Israel. It was collected in Lebanon near Beirut in 1930 by Gombault (P. Jovet, mss). D. Zohary (pers. comm.) saw the plant for the first time 13 km SW of Tel-Aviv in 1957 and A. Zehavi (pers. comm.) in 1958 in the Hula valley. Unfortunately, the specimens collected were not adequate. For some years it was considered as a hybrid between *C. bonariensis* and *C. canadensis*, resembling the first in its indumentum and the latter in its branching and height.

Since summer 1974, it has been collected in several other places (see appendix). It grows together with the two other *Conyza* species, and seems to have some biological advantages over them; it develops as many heads as *C. canadensis* but with a larger number of diaspores per head; its seedlings from the autumn germination develop a leaf rosette which facilitates their competition with the other species germinating in spring.

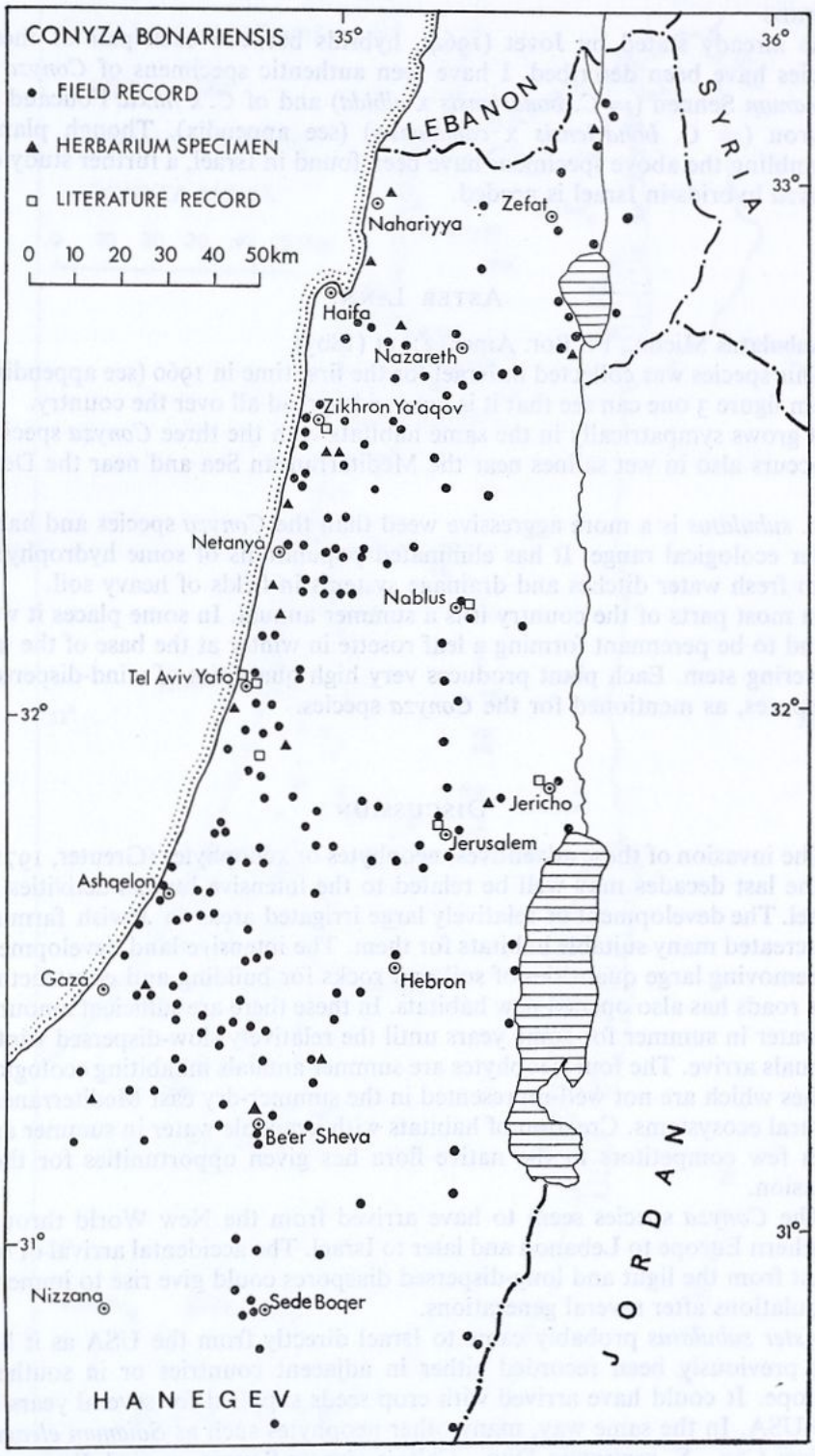

FIG. 1. Distribution of *Conyza bonariensis* in Israel.

HYBRIDS

As already stated by Jovet (1964), hybrids between each pair of these species have been described. I have seen authentic specimens of *Conyza* x *daveanum* Sennen (= *C. bonariensis* x *albida*) and of *C.* x *mixta* Foucaud & Neyrou (= *C. bonariensis* x *canadensis*) (see appendix). Though plants resembling the above specimens have been found in Israel, a further study of *Conyza* hybrids in Israel is needed.

Aster Linn.

A. subulatus Michx., Fl. Bor. Amer. 2:111 (1803).

This species was collected in Israel for the first time in 1960 (see appendix). From figure 3 one can see that it is now widespread all over the country.

It grows sympatrically in the same habitats with the three *Conyza* species. It occurs also in wet salines near the Mediterranean Sea and near the Dead Sea.

A. subulatus is a more aggressive weed than the *Conyza* species and has a wider ecological range. It has eliminated populations of some hydrophytes from fresh water ditches and drainage systems in fields of heavy soil.

In most parts of the country it is a summer annual. In some places it was found to be perennant forming a leaf rosette in winter at the base of the tall flowering stem. Each plant produces very high quantities of wind-dispersed diaspores, as mentioned for the *Conyza* species.

Discussion

The invasion of these adventives, neophytes or xénophytes (Greuter, 1971), in the last decades may well be related to the intensive human activities in Israel. The development of relatively large irrigated areas in Jewish farming has created many suitable habitats for them. The intensive land development by removing large quantities of soil and rocks for building and constructing new roads has also opened new habitats. In these there are sufficient amounts of water in summer for some years until the relatively slow-dispersed winter annuals arrive. The four neophytes are summer annuals inhabiting ecological niches which are not well-represented in the summer-dry east Mediterranean natural ecosystems. Creation of habitats with available water in summer and with few competitors in the native flora has given opportunities for their invasion.

The *Conyza* species seem to have arrived from the New World through southern Europe to Lebanon and later to Israel. The accidental arrival of one plant from the light and long-dispersed diaspores could give rise to immense populations after several generations.

Aster subulatus probably came to Israel directly from the USA as it had not previously been recorded either in adjacent countries or in southern Europe. It could have arrived with crop seeds supplied for several years by the USA. In the same way, many other neophytes such as *Solanum eleagnifolium* Cav., *S. rostratum* Dun., *Chloris virgata* Swartz, several *Eragrostis*, *Panicum* and *Euphorbia* species could have arrived.

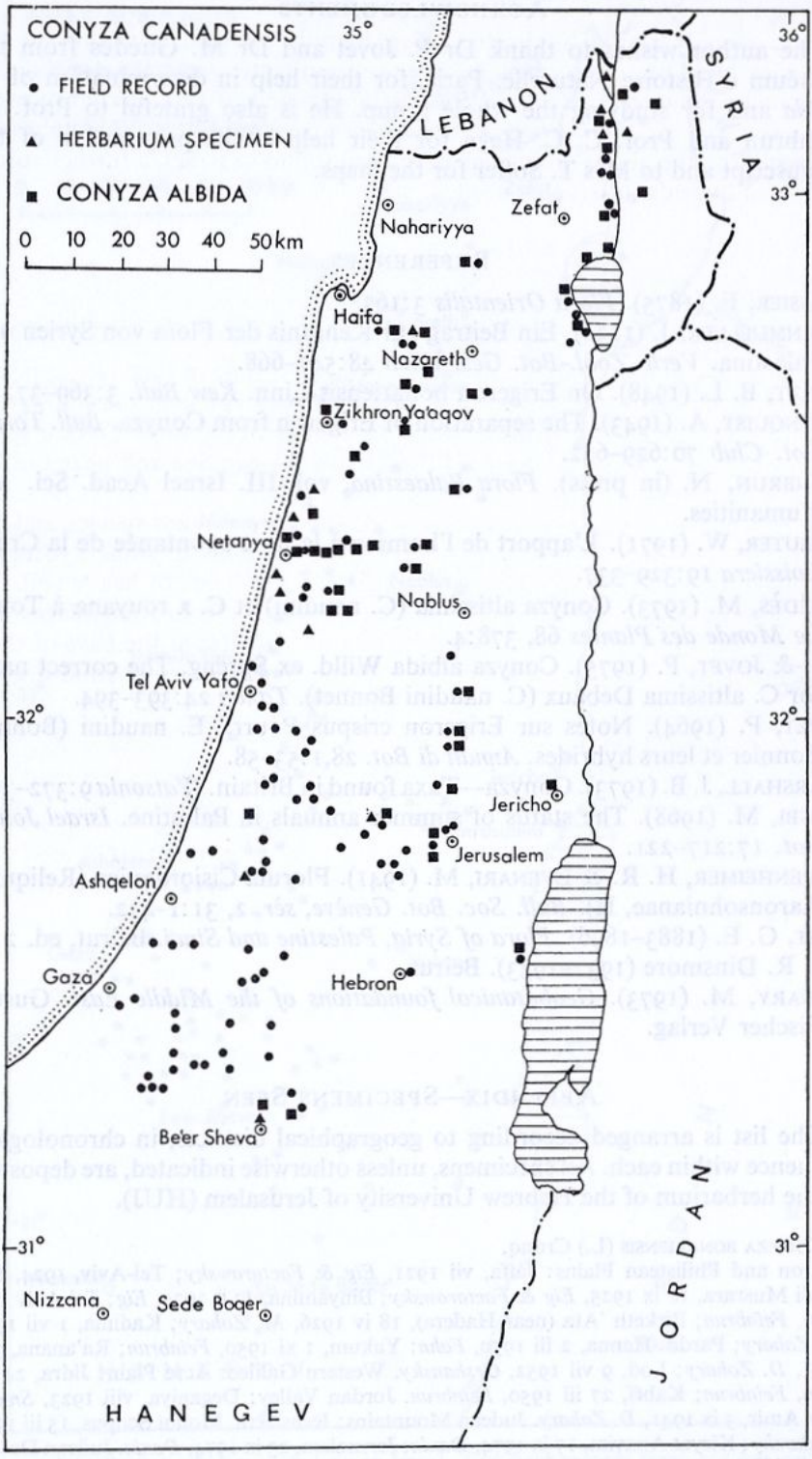

FIG. 2. Distribution of *Conyza canadensis* and *C. albida* in Israel.

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Appendix—Specimens Seen

The list is arranged according to geographical districts, in chronological sequence within each. All specimens, unless otherwise indicated, are deposited in the herbarium of the Hebrew University of Jerusalem (HUJ).

1. Conyza bonariensis (L.) Cronq.

Sharon and Philistean Plains: Jaffa, vii 1921, *Eig & Factorowsky*; Tel-Aviv, 1924, *Eig*; Wadi Musrara, 10 ix 1925, *Eig & Factorowsky*; Binyamina, 13 x 1925, *Eig*; Tel-Aviv 7 iv 1929, *Feinbrun*; Birketh 'Ata (near Hadera), 18 iv 1926, *M. Zohary*; Kadima, 1 vii 1949, *M. Zohary*; Pardes-Hanna, 2 iii 1950, *Fahn*; Yakum, 1 xi 1950, *Feinbrun*; Ra'anana, 3 ix 1951, *D. Zohary*; Lod, 9 vii 1952, *Orshansky*. Western Galilee: Acre Plain: Jidra, 24 viii 1926, *Feinbrun*; Kabri, 27 iii 1950, *Feinbrun*. Jordan Valley: Deganiya, viii 1923, *Smoly*; near Amir, 3 ix 1941, *D. Zohary*. Judean Mountains: Jerusalem, Mount Scopus, 15 iii 1931, *Amdursky*; Kiryat Anavim, 17 ix 1974, *Danin*; Jerusalem, 23 ix 1974, *Danin*. Judean Desert: Wadi el Kelt, 28 xi 1911, *Dinsmore*. Negev: Nir-Am, 6 vii 1949, *D. Zohary*; near Be'er Sheva, 24 ix 1974, *Danin*; Tel Shoket, 24 ix 1974, *Danin*.

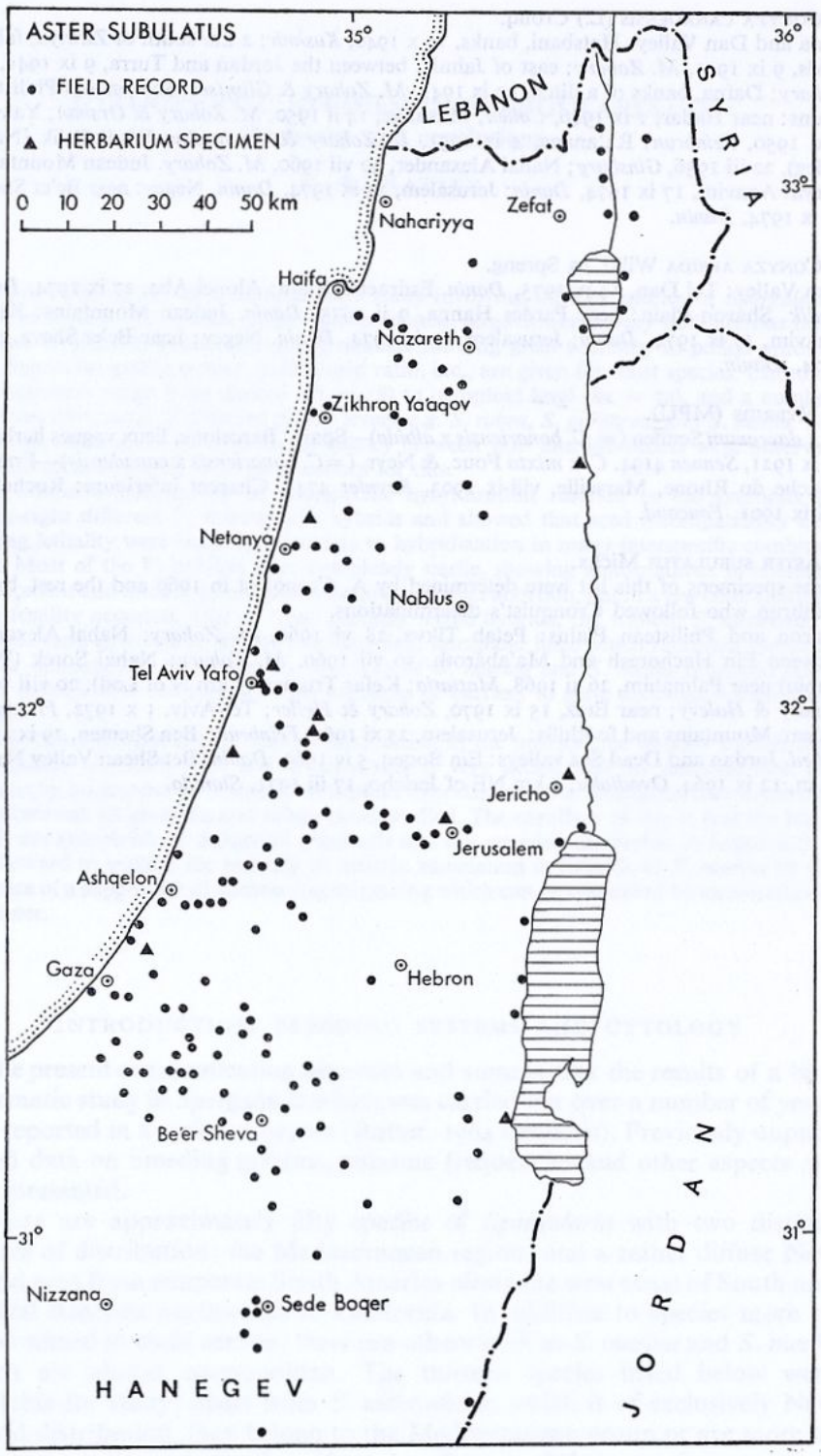

FIG. 3. Distribution of *Aster subulatus* in Israel. Two field records from 3–5 km north of Elat are not shown.

2. CONYZA CANADENSIS (L.) Cronq.
Hula and Dan Valley: Hatsbani, banks, 19 x 1940, *Kushnir*; 2 km south of Zawiya, fallow fields, 9 ix 1941, *M. Zohary*; east of Jahula, between the Jordan and Turra, 9 ix 1941, *M. Zohary*; Dafna, banks of a ditch, 10 ix 1941, *M. Zohary & Glimtser*. Sharon and Philistean Plains: near Hadar, 1 ix 1946, *Cohen*; Masmiye, 14 ii 1950, *M. Zohary & Orshan*; Yakum, 1 xi 1950, *Feinbrun*; Ra'anana, 4 ix 1951, *D. Zohary & Amdursky*; Wadi Falik (Nahal Poleg), 22 iii 1956, *Ginsburg*; Nahal Alexander, 30 vii 1960, *M. Zohary*. Judean Mountains: Kiryat Anavim, 17 ix 1974, *Danin*; Jerusalem, 23 ix 1974, *Danin*. Negev: near Be'er Sheva, 24 ix 1974, *Danin*.

3. CONYZA ALBIDA Willd. ex Spreng.
Dan Valley: Tel Dan, 14 iv 1975, *Danin*. Esdraelon Plain: Alonei Aba, 27 ix 1974, *Dvora Rudik*. Sharon Plain: near Pardes Hanna, 9 ii 1975, *Danin*. Judean Mountains: Kiryat Anavim, 17 ix 1974, *Danin*; Jerusalem, 23 ix 1974, *Danin*. Negev: near Be'er Sheva, 24 ix 1974, *Danin*.

4. HYBRIDS (MPU).
C. x *daveanum* Sennen (= *C. bonariensis* x *albida*)—Spain: Barcelone, lieux vagues herbaux, 24 ix 1921, *Sennen* 4194. *C.* x *mixta* Fouc. & Neyr. (=*C. bonariensis* x *canadensis*)—France: Bouche du Rhone, Marseille, viii-ix 1903, *Reynier* 4743. Charent inferieure: Rochefort, viii-ix 1901, *Foucaud*.

5. ASTER SUBULATUS Michx.
Some specimens of this list were determined by A. Cronquist in 1969 and the rest by N. Feinbrun who followed Cronquist's determinations.
Sharon and Philistean Plains: Petah Tikva, 28 vi 1960, *M. Zohary*; Nahal Alexander between Ein Hachoresh and Ma'abaroth, 30 vii 1960, *M. Zohary*; Nahal Sorek (Wadi Rubin) near Palmahim, 26 xi 1968, *Mattatia*; Kefar Truman (5 km N of Lod), 20 viii 1970, *Zohary & Halevy*; near Erez, 15 ix 1970, *Zohary & Heller*; Tel-Aviv, 1 x 1972, *Friedman*. Judean Mountains and foothills: Jerusalem, 25 xi 1961, *Feinbrun*; Ben Shemen, 29 ix 1968, *Eshed*. Jordan and Dead Sea valleys: Ein Boqeq, 5 iv 1963, *Danin*; Bet Shean Valley Neveh Eitan, 12 ix 1964, *Ovadiahu*; 5 km NE of Jericho, 17 iii 1971, *Shmida*.